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THIRD YEAR'S EXPERIMENTS IN THE TREATMENT OF GRAPE-VINE MILDEW IN THE BOMBAY PRESIDENCY.

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PREFACE.

I have again to acknowledge with thanks the valuable aid rendered during the third year of these experiments by Ráo Sáheb Gole and Mr. H. V. Gole of Násik and Mr. N. V. Kirtane of Mundwa.

2. The smallness of the bulletin is due to the fact that all the necessary information about the matters not treated of at length here is contained in the two previous bulletins and in the Maráthi leaflets which have been issued on this subject.

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Poona, March 1912.

THIRD YEAR'S EXPERIMENTS IN THE TREATMENT OF GRAPE-VINE MILDEW IN THE BOMBAY PRESIDENCY.

In Bulletins No. 36 of 1910 and No. 45 of 1911 issued by the Bombay Department of Agriculture accounts have been given of the inception and progress of the Experimental treatment of Grape-vine mildew at Násik, Mundwa and Ganeshkhind. Work was continued on the same lines for a third year, namely 1911-1912, and this work is here recorded. The results now obtained are so conclusive that it is not proposed to carry on the work further as an experiment but to endeavour to popularise the treatment which has proved so successful.

Summary of Previous Two Years' Work.

The methods employed consisted in careful pruning, removal of old bark, and periodic spraying with Bordeaux mixture plus soap, in two strengths and at varying intervals. These methods are fully recorded in the above-mentioned two bulletins. The result of the two years' work summarised is as follows.

The percentage of *attacked bunches* per tree was considerably reduced, the amount of reduction varying from 12 to 80 per cent. with the thoroughness of the spraying and the nature of the environment. The percentage of *attacked berries* per bunch was also much reduced. The visible difference, especially at Násik, between an unsprayed and a sprayed garden was enormous.

Programme of Third Year's Work.

After considering the previous two years' work the following programme for the third year's treatment was drawn up :—

Spraying—

(1) May 1st ... One spraying with Normal Bordeaux plus soap.

(2) Mid-August ... " " " " soon after end of South-west monsoon.

(3) Mid-October-November	...	One spraying with Normal Bordeaux plus soap before the flowers open.
(4) January 1st	...	One spraying with half normal Bordeaux plus soap about this date.
(5) February 1st	...	,, ,, ,, ,,
(6) March 1st	...	,, ,, ,, if necessary.

The actual sprayings given in Násik to 400 vines under experiment were—

(1) May 27th, 28th, 1911	...	Normal Bordeaux plus soap.
(2) August 31st, September 1st	...	,, ,, ,,
(3) November 19th, 20th	...	,, ,, ,,
(4) December 20th, 1911, January 1st, 1912	...	Half normal plus soap (with extra soap to the extent of 1 lb. per 50 gallons mixture).

Four sprayings were in this case found quite sufficient, so the last two in the programme were dropped. The extra soap in the last spraying was to make the mixture stick better to the bunches.

In Mundwa the actual sprayings given were—

(1) May 27th-29th, 1911	...	Normal Bordeaux plus soap.
(2) August 21st, 24th	...	,, ,, ,,
(3) December 26th, 28th	...	Half ,, ,, ,,
(4) January 6th, 7th, 1912	...	,, ,, ,, ,,

(This early repetition was due to the previous spraying not being thorough ; (3) and (4) may be looked on as one spraying.)

The amount of mildew in Mundwa was much less than at Násik and the berries were ripe at an earlier date. The early ripeness was due to early pruning.

In Ganeshkhind the actual sprayings were—

(1) May 27th, 1911	...	Normal Bordeaux plus soap.
(2) August 21st	...	,, ,, ,,
(3) December 6th	...	,, ,, ,,
(4) December 29th	...	Half ,, ,, ,,
(5) January 6th, 1912	...	,, ,, ,, ,,

The attack here was heavy and difficult to combat. This may be due to (1) the fact that these vines are of different foreign varieties, (2) that there are large trees in the neighbourhood, (3) that an old well is quite close and may make the air very damp. The number of vines treated was only 32, and 13 only fruited; these latter contained three varieties and therefore statistics could not be taken.

Results of Third Year's work.

The following statistics show the effect of the sprayings.

The usual method was followed. Six plants in line and six diagonally were taken and the percentage of mildewed bunches in sprayed and unsprayed vine-yards calculated. The percentage of mildewed berries of typical bunches of each tree was also taken. The results are :—

(1) *Násik* (February 11th, 1912)—

Percentage of mildewed bunches in unsprayed vine-yard 100, in sprayed 21.

Percentage of mildewed berries per bunch in unsprayed 22.

Do. do. sprayed 1·5.

(2) *Mundwa* (January 31st, 1912)—

Percentage of mildewed bunches in unsprayed portion 42, in sprayed 6·5.

(3) *Mundwa* (February 21st, 1912)—

Percentage of midewed bunches in unsprayed portion 64·5; in sprayed 1·7.

Berries affected—unsprayed 3·0 per cent.; sprayed 0·15 per cent.

Averaging we get percentage of bunches attacked—

(1) In sprayed.	In unsprayed.
21	100
6·5	42
01·7	64·5
3) 29·2 (9·7	3) 206·5 (68·8
27	
22	
21	
1	

Percentage of berries per bunch affected—

Sprayed.	Unsprayed
1·50	22
0·15	3·0
2) 1·65	2) 25·0
0·82	12·5

The above results conclusively demonstrate the usefulness of the treatment and when it is considered that the sprayed plants were in the neighbourhood of unsprayed plants and that the air was full of mildew spores, we may hope that when spraying is universal the results will be the almost entire extinction of the blight.

Practical Directions for Spraying revised up to date.

The sprayings should be done at the following times :—

(1) Mid-May ...		Normal	Bordeaux	plus soap.
(2) Mid-August ...		"	"	"
(3) Mid-October ...		"	"	"
(4) December 1st ...	Half	"	"	"
(5) January 1st ...	"	"	"	"

Cost :—

Barrel etc. (*see* Bulletin 36).

Materials for 25 gallons—

		Rs.	a.	p.
Copper Sulphate	— 3 lbs. @ 4 annas per lb. wholesale rates...	0	12	0
Lime	— 2 lbs. @ 3 pies per lb....	0	0	6
Soft soap	— $2\frac{1}{2}$ lbs. @ 2 annas per lb....	0	5	0
		1	1	6
	Half strength for 25 gallons ...	0	8	9

25 gallons is sufficient for 85 vines. If 5 sprayings are given the cost of treating 85 vines is Rs. 4-6-0. One Násik bigha (0·516 acre) usually has 400 vines and will cost Rs. 20-8-0 with three normal and two half normal sprayings. For method of making and using mixture, see Bulletin 36.

One vine costs therefore one anna at outside per annum per vine—labour extra.

Amount of Copper left on Sprayed Grapes.

In Bulletin No. 36 of 1910, page 12, analyses showing the amount of copper left on the sprayed bunches were given.

This year similar analyses were made from grapes sprayed at Mundwa with the results :—

Average weight of bunch in grammes.	Copper soluble in water, grammes.	Copper insoluble in water, grammes	Total copper.
126·00	·003	·001	·004

Averaging the results of two years we get :—

152·2	·005	·002	·007

This means that in order to absorb 0·5 grammes of copper which is the amount which must be absorbed for bad effects to show (*see* Bulletin No. 36, page 13) the consumer would have to eat 25·16 lbs. of grapes. The said consumer would probably feel the effects of excess of grapes before the excess of copper began to trouble him.

Removal of Stains from Grapes.

It is *not* desirable that grape-dealers should wash the stains from the grapes and then pack them. In this way moisture will remain in the bunch and it will go bad in transit. Consumers should be instructed to wash the grapes before eating

The stains may be removed in any of the three following ways :—

(i) Keep sugarcane in a jar from six to eight days till it ferments. Then dip the bunch in this juice and move it about in the juice for two minutes. Afterwards wash off the juice with clean water and it will be found that the stains are gone.

(ii) Dipping the bunch in vinegar has the same effect as dipping in sugarcane juice.

(iii) Soak the berries in clean water for a night. This removes most, but not all, of the stains. Wiping with a damp cloth removes stains completely.

An appeal for experimenting.

These three years' work show that spraying is a success as a remedy for mildew, and on the strength of these experiments the

above recommendations were given and the above methods demonstrated to a meeting of grape-growers in Násik on 11th February 1912. To make this remedy of real value it is necessary that grape-growers should take it up and spray for themselves. If they are sceptical or doubtful about the method, all that is asked of them is to procure the few cheap materials requested and to spray a few trees for a year in accordance with the scheme here laid down, at the same time attending to pruning, cleanliness and moderate watering. After this year's experiment of their own there is no doubt they will extend the spraying operations. Hence all that is here asked is that grape-growers should at least give a trial to these methods.

It must be remembered that the success of a method like this, just like the methods for combating human disease, depends on the whole community of people interested taking up the remedy. When *all* the vine-yards in a village are sprayed each individual grower has a better chance, since his sprayed vine-yard is not being perpetually reinfected from neighbouring non-sprayed and badly mildewed gardens